

Appl. No. 09/996,834
Amdt. dated 01/29/2004
Reply to 01/09/2004 Office action

Amendments to the Claims:

This listing of claims will replace all prior versions, and listing, of claims in the application:

Listing of Claims:

- Claim 1 (currently amended): A method for calculating a scale relationship for an imaging system, the method comprising:
- (a) selecting a characteristic having a known value, ~~the characteristic to be measured in an image,~~ and the characteristic associated with an object;
 - (b) acquiring, using the imaging system, ~~the an~~ image of at least a portion of the characteristic of the object;
 - (c) finding and measuring the characteristic in the image to provide the measured value;
 - (d) calculating a scale relationship between the object and the image, using the measured value and the known value; and
 - (e) processing the image using the scale relationship.
- Claim 2 (original): The method of claim 1, wherein the object is a fiber-optic end-face, and wherein selecting the characteristic further includes:
selecting, as the characteristic, a diameter of a substantially annular cladding of the fiber-optic end-face.
- Claim 3 (original): The method of claim 1, wherein selecting the characteristic further includes:
selecting, as the characteristic, an aspect of a feature of the object, and
wherein finding and measuring further includes:

Appl. No. 09/996,834
Amdt. dated 01/29/2004
Reply to 01/09/2004 Office action

finding the feature in the image and measuring the aspect of the feature to provide the measured value.

Claim 4 (original):

The method of claim 1, wherein finding and measuring further includes:

generating at least one model of at least part of the object, the model including the characteristic; searching the image to find a best match to the at least one model; and measuring the characteristic of the best match to provide the measured value.

Claim 5 (original):

The method of claim 1, wherein finding and measuring further includes:

finding the characteristic in the image and measuring an aspect of the characteristic in the image to provide the measured value.

Claim 6 (original):

The method of claim 1, wherein processing further includes:

processing more than one image using the scale relationship.

Claim 7 (original):

The method of claim 1, wherein the characteristic associated with the object is associated with each object of a plurality of objects, the method further comprising:

(f) repeating (b) – (e) with each of the plurality of the objects.

Claim 8 (currently amended):

An apparatus for calculating a scale relationship for an imaging system, the apparatus comprising:

an object having a characteristic with a known value;
~~the characteristic to be measured in an image;~~
~~an~~the image of at least a portion of the characteristic,

Appl. No. 09/996,834
Amdt. dated 01/29/2004
Reply to 01/09/2004 Office action

the image being acquired by the imaging
system;

finding means adapted to find the characteristic in the
image;

measuring means, in cooperation with the finding
means, adapted to measure the characteristic in
the image to provide a measured value;

scale means, in cooperation with the measuring means,
adapted to determine a scale relationship
between the image and the object, using the
measured value and the known value; and
processing means, in cooperation with the scale means,
adapted to process the image using the scale
relationship.

Claim 9 (previously amended): The apparatus of claim 8, wherein the object is a fiber-optic end-face, and wherein the characteristic is a diameter of a substantially annular cladding of the fiber-optic end-face.

Claim 10 (previously amended): The apparatus of claim 8, wherein the finding means further includes:
modeling means, adapted to generate at least one model
of at least part of the object, the at least one
model including the characteristic; and
searching means, in cooperation with the modeling
means, adapted to search the image to find a
best match to the at least one model, and
wherein the measuring means is further adapted to
measure the characteristic of the best match to
provide the measured value.

Claim 11 (previously amended): The apparatus of claim 8, wherein the characteristic is

Appl. No. 09/996,834
Amdt. dated 01/29/2004
Reply to 01/09/2004 Office action

an aspect of a feature of the object, and
wherein the finding means is further adapted to find the
feature, and
wherein the measuring means is further adapted to
measure the aspect of the feature to provide the
measured value.

Claim 12 (previously amended): The apparatus of claim 8, wherein processing means is
further adapted to process a plurality of images using
the scale relationship, the apparatus further comprising:
a plurality of objects; and
acquiring means, in cooperation with the imaging
system, adapted to acquire the plurality of
images of the plurality of objects, respectively.

Claim 13 (currently amended): A method for calculating a scale relationship for an
imaging system, the method comprising:

- (a) selecting a characteristic having an aspect with a
known value, ~~the aspect to be measured in an
image, and the characteristic being associated~~
with an object;
- (b) acquiring, using the imaging system, ~~an~~the
image of at least a portion of the characteristic
of the object;
- (c) finding the characteristic in the image and
measuring the aspect of the characteristic in the
image to provide a measured value;
- (d) calculating the scale relationship for the imaging
system, using the measured value and the
known value; and
- (e) inspecting the object in the image using the
scale relationship.

Appl. No. 09/996,834
Amdt. dated 01/29/2004
Reply to 01/09/2004 Office action

Claim 14 (original):

The method of claim 13, wherein the object is an end-face of a fiber-optic cable, and wherein inspecting further includes:
finding potential defects in the image of the end-face;
measuring the potential defects in the image of the end-face;
and
calculating a physical size of the potential defects using the scale relationship.

Claim 15 (original):

The method of claim 14, wherein selecting the characteristic further includes:
selecting, as the characteristic, a diameter of an annular cladding of the end-face of the fiber-optic cable.

Claim 16 (original):

The method of claim 15, wherein finding the characteristic in the image and measuring further includes:
generating at least one model of the annular cladding of the end-face of the fiber-optic cable;
finding in the image a best match to the at least one model; and
measuring the diameter of the best match to provide the measured value.

Claim 17 (original):

The method of claim 16, wherein generating the at least one model, further includes:
generating, as the at least one model, at least one scale-invariant model.

Claim 18 (original):

The method of claim 14, wherein selecting the characteristic further includes:
selecting, as the characteristic, a diameter of a stress rod of the end-face of the fiber-optic cable.

Claim 19 (original):

The method of claim 13, wherein the characteristic

Appl. No. 09/996,834
Amdt. dated 01/29/2004
Reply to 01/09/2004 Office action

associated with the object is associated with each object of a plurality of the objects, the method further comprising:

(f) repeating (b) – (e) with each of the plurality of objects.

Claim 20 (currently amended):

An apparatus for calculating a scale relationship for an imaging system, the apparatus comprising:

a characteristic having an aspect with a known value,

~~the aspect to be measured in an image, and the~~

~~characteristic being associated with an object;~~

an image, acquired by the imaging system, of at least a portion of the characteristic of the object,

finding means, adapted to find the characteristic in the image;

measuring means, in cooperation with the finding

means, adapted to measure the aspect of the

characteristic in the image to provide a

measured value;

scale means, in cooperation with the measuring means,

adapted to calculate a scale relationship between

the image and the object, using the measured

value and the known value; and

inspecting means, in cooperation with the scale means,

adapted to inspect the object in the image using

the scale relationship.

Claim 21 (original):

The apparatus of claim 20, wherein the object is an end-face of a fiber-optic cable, and wherein inspecting

means further includes:

defect means, adapted to find potential defects in the image of the end-face;

Appl. No. 09/996,834
Amdt. dated 01/29/2004
Reply to 01/09/2004 Office action

defect-measuring means, in cooperation with the defect means, adapted to measure the potential defects in the image of the end-face; and
size means, in cooperation with the defect-measuring means and the scale means, adapted to calculate a physical size of the potential defects using the scale relationship.

Claim 22 (original):

The apparatus of claim 21, wherein the characteristic is a diameter of an annular cladding of the end-face of the fiber-optic cable.

Claim 23 (original):

The apparatus of claim 22, wherein the finding means further includes:
modeling means, adapted to generate at least one model of the annular cladding;
searching means, in cooperation with the modeling means, adapted to search the image to find a best match to the at least one model; and
wherein the measuring means is further adapted to measure the diameter of the best match to provide the measured value.

Claim 24 (original):

The apparatus of claim 23, wherein the modeling means is further adapted to generate at least one scale-invariant model.

Claim 25 (original):

The method of claim 21, wherein the characteristic is a diameter of a stress rod of the end-face of the fiber-optic cable.

Claim 26 (previously amended):

The apparatus of claim 20, further comprising:
a plurality of objects, each object of the plurality of objects associated with the characteristic; and
the plurality of images acquired by the imaging system,

Appl. No. 09/996,834
Amdt. dated 01/29/2004
Reply to 01/09/2004 Office action

of at least a portion of the characteristic for each object of the plurality of objects, and
wherein the finding means is further adapted to find the characteristic in each of the plurality of images,
wherein the measuring means is further adapted to measure within each of the plurality of images, the characteristic, so as to provide a plurality of measured values,
wherein the scale means is further adapted to calculate a scale relationship between each of the plurality of objects and each of the plurality of images using the known value and the respective measured value of the plurality of measured values, so as to provide the plurality of scale relationships, and
wherein the inspection means is further adapted to inspect each of the plurality of images using the respective scale relationship of the plurality of scale relationships.

Claim 27 (currently amended): A method for calculating a scale relationship for an imaging system, the method comprising:
selecting a characteristic having a known value, the characteristic ~~to be measured in an image, and being~~ associated with each object of a plurality of objects;
acquiring, with the imaging system, ~~an~~ the image of at least a portion of the characteristic for each object of the plurality of objects, so as to provide a plurality of images;
finding the characteristic in each of the plurality of

Appl. No. 09/996,834
Amdt. dated 01/29/2004
Reply to 01/09/2004 Office action

images;
measuring, within each of the plurality of images, the
characteristic, so as to provide a plurality of
measured values;
calculating a scale relationship between each of the
plurality of objects and each of the plurality of
images using the known value and the
respective measured value of the plurality of
measured values, so as to provide the plurality
of scale relationships; and
processing each of the plurality of images using the
respective scale relationship of the plurality of
scale relationships.

Claim 28 (original):

The method of claim 27, wherein finding the
characteristic in the image further includes:
generating at least one model of at least part of the
object, the model including the characteristic;
and
searching the image to find a best match to the at least
one model, and
wherein measuring the characteristic further includes:
measuring the characteristic of the best match to
provide the measured value.

Claim 29 (original):

The method of claim 27, wherein the object is a fiber-
optic end-face, and selecting the characteristic further
includes:
selecting, as the characteristic, a diameter of a
substantially annular cladding of the fiber-optic
end-face.

Claim 30 (previously amended): The method of claim 27, wherein processing the image

Appl. No. 09/996,834
Amdt. dated 01/29/2004
Reply to 01/09/2004 Office action

further includes:

inspecting the image using the respective scale
relationship.

- Claim 31 (currently amended): A method for, at least partially, calibrating an imaging system, the method comprising:
- (a) selecting a characteristic having a known value, the characteristic ~~to be measured in an image, and being associated~~ with each of a plurality of objects;
 - (b) acquiring, using the imaging system, ~~the an~~ image of at least a portion of the characteristic of one object of the plurality of objects;
 - (c) finding the characteristic in the image and measuring the characteristic in the image to provide a measured value;
 - (d) calibrating, at least partially, the imaging system by calculating a scale relationship between the image and the object, using the measured value and the known value; and
 - (e) processing the image using the scale relationship.
- Claim 32 (original): The method of claim 30, further comprising:
- (f) repeating (b) – (e) with each of the plurality of objects.
- Claim 33 (previously added): The method of claim 1, wherein the characteristic is a fiducial.
- Claim 34 (previously added): The method of claim 33, wherein the fiducial is a grid of dots.
- Claim 35 (previously added): The method of claim 1, wherein the characteristic is a relationship between features of the object.

Appl. No. 09/996,834
Amdt. dated 01/29/2004
Reply to 01/09/2004 Office action

- Claim 36 (previously added): The method of claim 35, wherein the characteristic is a distance between two fiducials on the object.
- Claim 37 (previously added): The method of claim 4, wherein generating the at least one model, further includes:
generating, as the at least one model, at least one scale-invariant model.
- Claim 38 (previously added): The apparatus of claim 8, wherein the characteristic is a fiducial.
- Claim 39 (previously added): The apparatus of claim 8, wherein the characteristic is a relationship between features of the object.
- Claim 40 (previously added): The apparatus of claim 39, wherein the features are dots within a grid of dots.